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# (12) UK Patent Application (19) GB (11) 2 384 042 (13) A

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(56) Documents Cited

GB 2350414 A

WO 1997/005444 A

US 5962806 A

US 5698815 A

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INT CL<sup>7</sup> F41B, F41H, F42B, H05C

Other: Online: WPI, EPODOC

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(54) Abstract Title

**A projectile for delivery of an electric charge**

(57) A projectile for delivering a stun electric charge comprises a body 1 with a rear container 2 housing one or more electric storage cells 3. A module 4 incorporates a voltage step-up transformer 5 with an associated electronic control circuit board 6. A forward nose portion 7 has a series of collapsible or compressible elements 8 and an outer inflatable or expandable membrane 9 with an associated gas producing charge or gas storage device and a detonator or sensor to produce inflation on or just before impact with a target (Fig. 2). The nose has two axially aligned electrodes 10 connected to opposed poles of the high voltage generator or transformer 5. A nose plate 11 is arranged to move rearwardly on target impact allowing the electrodes to penetrate the target outer layer to deliver the electric charge.

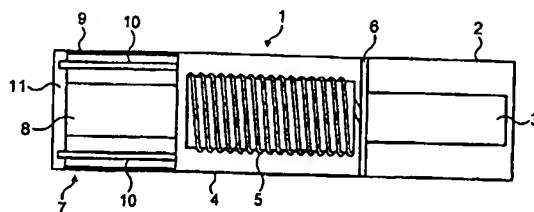


FIG. 1

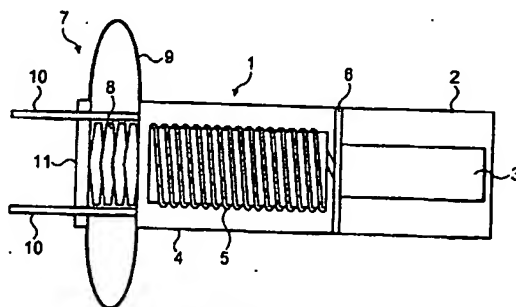


FIG. 2

GB 2 384 042 A

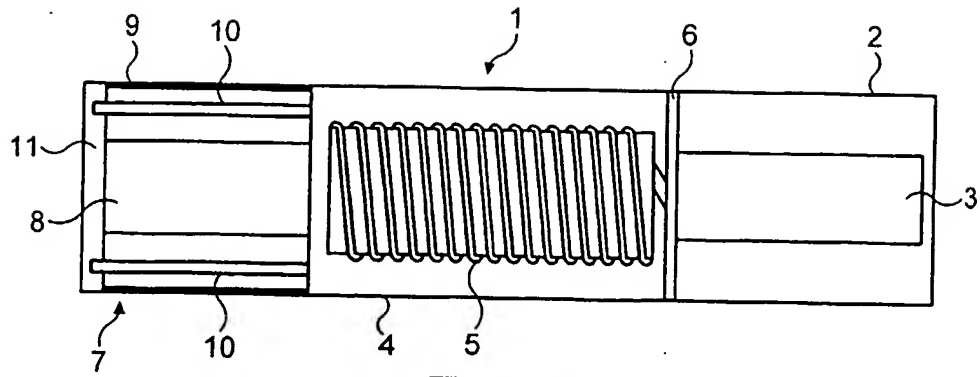


FIG. 1

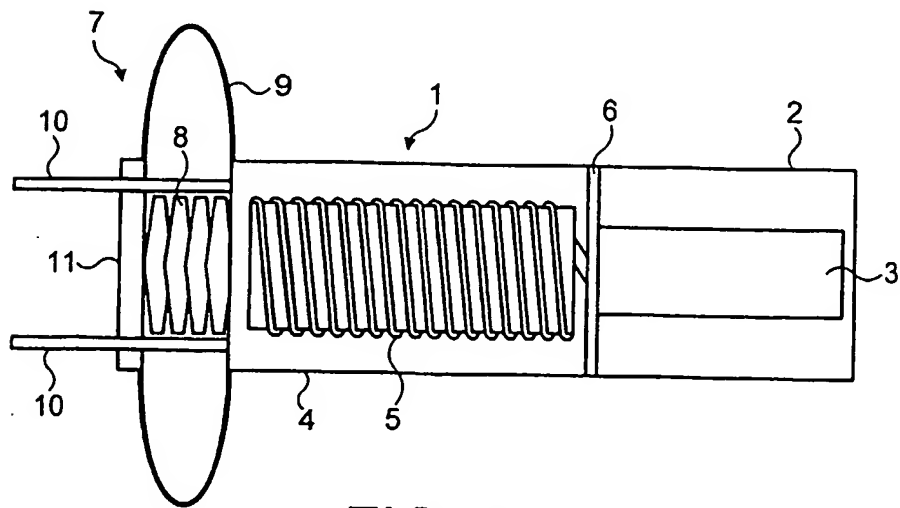


FIG. 2

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**Title:****Projectile for delivery of an electric charge.**

This invention relates to a non-lethal projectile primarily for the purpose  
5 of incapacitating a selected target.

One object of this invention is to provide a projectile which does not  
itself bodily penetrate a target but which may deliver an electric charge serving  
to incapacitate a life-form such as an animal including a human.

In accordance with this invention there is provided a projectile with  
10 means to effectively retard the velocity of the projectile on impact with a target,  
the velocity retarding means comprises an inflatable membrane actuated on or  
close to impact, for example by a impact sensor or by means of a proximity  
sensing means, the membrane being inflated using gas pressure either stored  
in the projectile and preferably derived from the propulsive charge gases  
15 occurring on firing from a weapon or derived from an on-board ignitable  
charge, the projectile being characterised by an integral electrical storage  
means capable of delivering a electric charge through two spaced electrodes  
adapted to effectively contact or to pierce the surface of the target on initial  
impact.

20 The velocity is retarded in such a way following impact to allow sufficient  
penetration of the electrodes, through clothing or skin but to prevent excess  
injury or penetration and this is achieved by means which rapidly produces a  
large increase in area at the nose of the projectile thus spreading and  
dissipating the kinetic energy over a large area.

Preferably the projectile is adapted to be fired from a barrel weapon which may be rifled to impart spin. The projectile may be of sub-calibre design using a discarding sabot and be fired in a barrel having progressive rifled pitch to attain an appropriate velocity.

5        The construction permits use in confined spaces such as in vessels or aircraft where penetration of the hull or possible stressing following impact is to be avoided.

In one preferred construction the projectile has a body with a nose cavity containing a deformable or compressible material taking-up initial impact  
10       and a membrane which may be inflated by a pressure gas just before or after impact. Extending through the nose are two electrodes having portions projecting forwardly and adapted to penetrate the surface of a soft target. The electrodes connect with a source of high voltage derived from an electrical storage means such as a battery pack with an associated voltage transforming  
15       device and, in a preferred embodiment, a charge storage means such as a capacitor bank.

In one arrangement a capacitor bank in the projectile is charged to the required voltage level prior to discharge from a launching weapon which weapon includes a power pack to charge the capacitor bank immediately  
20       before firing or on arming the weapon.

A preferred construction incorporates a motion detector serving to impart a further electric discharge if the target moves after being initially hit.

The membrane itself may include electrical conductors or conductive tracks connecting with electrical probes which pierce the target to deliver the  
25       charge.

A further preferred construction includes an injecting device or mechanism to tranquillise or incapacitate the target following delivery of the electric charge. A capsule may be included to wet the area of impact to produce an enhanced effect by augmenting electric conduction around the impact area.

In another arrangement the projectile includes one or more electrical storage cells which power a high voltage generator the cells being discharged instantly on impact to produce a stun voltage delivered to the electrodes or shortly before or after firing from the weapon to charge a storage device.

In an alternative arrangement the projectile may include a series of piezo-electric elements arranged axially in the projectile with an associated mass which provides a compressive force on retardation of the projectile thereby generating the required voltage either directly or through a voltage transforming device.

The velocity retarding means may comprise a device to significantly increase the area of the projectile nose portion on initial impact thus dissipating kinetic energy over a large area.

In one construction the velocity retarding means comprises an inflatable membrane actuated by a sensor on initial impact or using a proximity sensing means.

In an alternative the membrane is pre-pressurised and expands following discarding of an overlaying covering forming a constraining means.

The membrane may be inflated through a detonator and gas producing explosive charge or through use of stored gas pressure. This charge or stored

pressure may also serve for the purpose of injecting the drug by driving a piston in the drug containing cavity.

The membrane can be located in the nose of the projectile comprising a readily broken, fragmenting, unfurling or deployable cap. The membrane may be in the form of a bag attached to and around a forward end of the electrodes thus preventing penetration beyond a predetermined depth.

The nose part of the projectile may include a solid foam-like or gel-like substance forming an impact absorbing material which spreads on impact. More specifically the gel may comprise a nano-porous open cell foam of the kind known by the trade mark Aerogel or a collapsing element.

This invention is further described and illustrated with reference to the drawings showing an embodiment by way of example only. In the drawings:

Fig 1 shows a longitudinal cross-section of a projectile in accordance with this invention,

Fig 2 shows the projectile during the target impact phase,

As shown in Fig. 1 of the drawings the projectile comprises a body 1 with a rear container 2 housing one or more cells 3. The cells may be Li-MH or Ni-MH capable of holding a charge long term. A central module 4 incorporates a voltage step-up transformer 5 with an associated electronic control circuit board 6. A forward nose portion 7 has a series of collapsible or compressible elements 8 and an outer inflatable or expandable, that is stretchable, membrane 9 with an associated gas producing charge or gas storage device and a detonator or sensor to produce inflation on impact with a target (such devices are not shown here).

The nose further includes two axially aligned electrodes 10 connected to opposed poles of the high voltage generator or transformer 5. A nose plate 11 is arranged to move rearwardly on target impact allowing the electrodes to penetrate the target outer layer to deliver the electric charge.

5        The nose of the projectile may include a fluid means to wet the target to increase conductivity and effectiveness of the charge.

On target impact, and as shown in Fig. 2, the nose plate 11 moves rearwardly and the membrane 9 is inflated through the inflation gas charge. The electrodes then project and penetrate the target outer material following  
10        which the electric charge is delivered by an instant discharge of the electrical energy in the cells 3 through the transforming device 5. Thus a high voltage high energy discharge is effected for a brief period designed to incapacitate the target

Further and preferred features are contained in the Claims  
15        appended hereto and as described in the foregoing.



**CLAIMS:**

1. A projectile with means to effectively retard the velocity of the projectile on impact with a target, the velocity retarding means comprises an inflatable or expandable membrane actuated on or close to target impact,  
5 the membrane being inflated using gas pressure, the projectile being characterised by an integral electrical storage means capable of delivering a electric charge through two spaced electrodes adapted to effectively contact or to pierce a surface of the target on initial impact coincident with or following inflation of the membrane.
- 10 2. A projectile in accordance with Claim 1, wherein the velocity is retarded in such a way and following impact to allow penetration of the electrodes through clothing or skin but to prevent excess injury or penetration.
3. A projectile in accordance with Claim 1 or 2, wherein the projectile is adapted to be fired from a barrel weapon which may be rifled to impart  
15 spin.
4. A projectile in accordance with any preceding Claim, wherein the projectile is of sub-calibre design using a discarding sabot and fired in a barrel having progressive rifled pitch to attain a velocity greater than 500 m/s.
- 20 5. A projectile in accordance with any preceding Claim, wherein the projectile has a body with a nose cavity containing a deformable or compressible material taking-up initial impact and a membrane inflated by a pressure gas just before or after impact.
6. A projectile in accordance with any preceding Claim, wherein two  
25 electrodes extend through the nose of the projectile, the electrodes

having portions projecting forwardly and adapted to penetrate the surface of a soft target.

7. A projectile in accordance with any preceding Claim, wherein the electrodes connect with a source of high voltage derived from an electrical storage means with an associated voltage transforming device  
5 and, preferably including a charge storage means such as a capacitor bank.
8. A projectile in accordance with any preceding Claim, wherein a capacitor bank in the projectile is charged to the required voltage level prior to  
10 discharge from a launching weapon which weapon includes a power pack to charge the capacitor bank immediately before firing or on arming the weapon.
9. A projectile in accordance with any preceding Claim, wherein the projectile includes one or more electrical storage cells which power a high  
15 voltage generator the cells being discharged instantly on impact to produce a stun voltage delivered to the electrodes or discharged shortly before or after firing from the weapon to charge a storage device.
10. A projectile in accordance with any preceding Claim, the projectile including a series of piezo-electric elements arranged axially in the  
20 projectile with an associated mass which provides a compressive force on retardation of the projectile thereby generating the required voltage either directly or through a voltage transforming device.
11. A projectile in accordance with any preceding Claim, wherein the velocity retarding means comprises a device to significantly increase the area of

the projectile nose portion on initial impact thus dissipating kinetic energy over a large area.

12. A projectile in accordance with any preceding Claim, wherein the velocity retarding means comprises an inflatable membrane actuated by a sensor on initial impact or using a proximity sensing means.
13. A projectile in accordance with any preceding Claim, wherein the membrane is pre-pressurised and expands following discarding of an overlaying covering forming a constraining means.
14. A projectile in accordance with any preceding Claim, wherein the membrane is inflated through a detonator and gas producing explosive charge or through use of stored gas pressure, the charge or stored pressure preferably serving the purpose of injecting or dissipating a fluid
15. A projectile in accordance with any preceding Claim, wherein the membrane is located in the nose of the projectile comprising a readily broken, fragmenting, unfurling or deployable cap.
16. A projectile in accordance with any preceding Claim, wherein the membrane is in the form of a bag attached to and around a forward end of the electrodes thus preventing penetration beyond a predetermined depth.
17. A projectile in accordance with any preceding Claim, wherein the nose part of the projectile includes a solid foam-like or gel-like substance forming an impact absorbing material which spreads on impact, preferably increasing surface conductivity of the target.

18. A projectile in accordance with any preceding Claim, wherein the inflatable or expandable membrane is actuated on or close to impact by means of an impact sensor or a proximity sensing means.
19. A projectile in accordance with any preceding Claim, wherein the  
5 membrane is inflated using gas pressure either stored in the projectile and preferably derived from the propulsive charge gases occurring on firing from a weapon or derived from an on-board ignitable charge.
20. A projectile in accordance with any preceding Claim, wherein a motion  
10 detector is included serving to impart a further electric discharge if the target moves after being initially hit.
21. A projectile in accordance with any preceding Claim, wherein the membrane itself may include electrical conductors or conductive tracks connecting with electrical probes which pierce the target to deliver the charge.
- 15 22. A projectile in accordance with any preceding Claim, wherein an injecting device or mechanism to tranquillise or incapacitate the target following delivery of the electric charge is incorporated into the projectile body.
23. A projectile in accordance with any preceding Claim, wherein a liquid  
20 containing capsule is included to wet the area of impact to produce an enhanced effect by augmenting electric conduction around the impact area.
24. A projectile constructed and arranged to function as described herein and exemplified with reference to the drawings.



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INVESTOR IN PEOPLE

Application No: GB 0223889.7  
Claims searched: 1 at least

Examiner: R C Squire  
Date of search: 9 May 2003

## Patents Act 1977 : Search Report under Section 17

### Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance	
Y	1-3,6-8 at least	GB 2350414A	BRYDGES-PRICE
Y	1-3,6-8 at least	WO 97/05444A	DAIMLER-BENZ
Y	1-3,6-8 at least	US 5962806	COAKLEY
Y	1-3,6-8 at least	US 5698815	RAGNER

### Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

### Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC<sup>v</sup>:

F3A

Worldwide search of patent documents classified in the following areas of the IPC<sup>7</sup>:

F42B, F41B, F41H, H05C

The following online and other databases have been used in the preparation of this search report:

Online: WPI, EPODOC

DERWENT-ACC-NO: 2003-580430

DERWENT-WEEK: 200355

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TITLE: Non-lethal projectile for delivering  
an electric charge for incapacitating a human or animal  
target has inflatable or expandable membrane to  
retard projectile following impact to allow penetration  
of stun electrodes through clothing or skin

INVENTOR: BRYDGES-PRICE, R I

PATENT-ASSIGNEE: BRYDGES-PRICE R I [BRYDI]

PRIORITY-DATA: 2001GB-0024696 (October 15, 2001)

PATENT-FAMILY:

PUB-NO	PAGES	PUB-DATE	MAIN-IPC
GB 2384042 A		July 16, 2003	
012	F42B 012/34		N/A

APPLICATION-DATA:

PUB-NO	APPL-DESCRIPTOR	APPL-NO
GB 2384042A	N/A	
2002GB-0023889	October 14, 2002	

INT-CL (IPC): F42B012/34, F42B012/36

ABSTRACTED-PUB-NO: GB 2384042A

BASIC-ABSTRACT:

NOVELTY - A forward nose portion (7) of the projectile body  
(1) includes a series of collapsible or compressible elements (8) and an  
outer inflatable or expandable membrane (9) with an associated gas producing

charge or gas storage device and a detonator or sensor to produce inflation on or just before impact with a target. The nose has two axially aligned electrodes (10) connected to opposed poles of a high voltage generator or transformer (5). A nose plate (11) is arranged to move rearwardly on target impact allowing the electrodes to penetrate the target outer layer to deliver the electric charge.

USE - For incapacitating a human or animal target by delivering a stun electric charge. Projectile may be used in confined spaces such as marine vessels or aircraft where penetration of the hull or possible stressing following impact needs to be avoided.

ADVANTAGE - Retards projectile following impact to allow sufficient penetration of electrodes through clothing or skin while preventing excessive injury or penetration by rapidly producing a large increase in area at the nose of the projectile, thus spreading and dissipating the kinetic energy over a large area.

DESCRIPTION OF DRAWING(S) - The drawings show a longitudinal cross-section of the projectile and the projectile during a target impact phase.

projectile body 1

rear container 2

electric storage cells 3

module 4

voltage step-up transformer 5

electronic control circuit board 6

forward nose portion 7

collapsible/compressible elements 8

inflatable/expandable membrane 9

electrodes 10

nose plate 11

CHOSEN-DRAWING: Dwg.1,2/2

TITLE-TERMS: NON LETHAL PROJECTILE DELIVER ELECTRIC CHARGE  
INCAPACITATE HUMAN

ANIMAL TARGET INFLATE EXPAND MEMBRANE RETARD  
PROJECTILE FOLLOW

IMPACT ALLOW PENETRATE STUN ELECTRODE THROUGH  
CLOTHING SKIN

DERWENT-CLASS: Q79 W07

EPI-CODES: W07-E09; W07-F01;

SECONDARY-ACC-NO:

Non-CPI Secondary Accession Numbers: N2003-461521